United States Air Force School of Aerospace Medicine

Integrity - Service - Excellence

Bioenvironmental Engineering (BE) Role in Emergency Response

U.S. AIR FORCE

On-Scene Commanders Course
Maxwell AFB, AL
XX Xxx 06

Col Michael J. Rusden
AFMOA/SGPB
DSN 297-4314

U.S. AIR FORCE

Overview

- Foundations
- BE Capabilities
- Response Equipment
- Recommendations

Foundations

U.S. AIR FORCE

BE Vision and Mission

Vision

Optimize combat and operational capabilities by preventing casualties and enhancing performance in the deployed and in garrison environments through full spectrum threat health risk reduction

Mission

Provide operational health risk assessment expertise to enhance commander decision making and health service support capabilities

U.S. AIR FORCE

BE Strategic Objective

- "Garrison = Deployed"
  - Common set of capabilities and skills for both garrison and deployed settings
  - Consistent application of skills and execution of capabilities across operational spectrum
  - "Day-to-Day = Response"
    - Anticipate, Identify, Evaluate, and Control
    - Recommend courses of action to improve operations and minimize health impacts

BE Capabilities

U.S. AIR FORCE

BE Capabilities

- **Full Spectrum (Health) Threat Response (FSHTR)**
  - **Mission planning (targeteering, weapons effects)**
  - **Attack (sectors, patient decon, mortuary affairs)**
  - **Mishap (aircraft, rolling stock, infrastructure)**
  - **Natural Disasters**

- **Occupational and Environmental Health Site Assessment (OEHSA)**
  - **Weapon systems**
  - **Infrastructure (workplace, community)**

U.S. AIR FORCE

BE Capabilities

- **Health Risk Assessment (HRA)**
  - **Identify potential/actual health hazards**
    - **Threat / Vulnerability assessments**
  - **Evaluate potential/actual health hazards**
    - **Identify / Quantify hazards**
  - **Control potential/actual health hazards**
    - **Recommend engineering controls**
    - **Recommend protective equipment**
    - **Recommend process change**

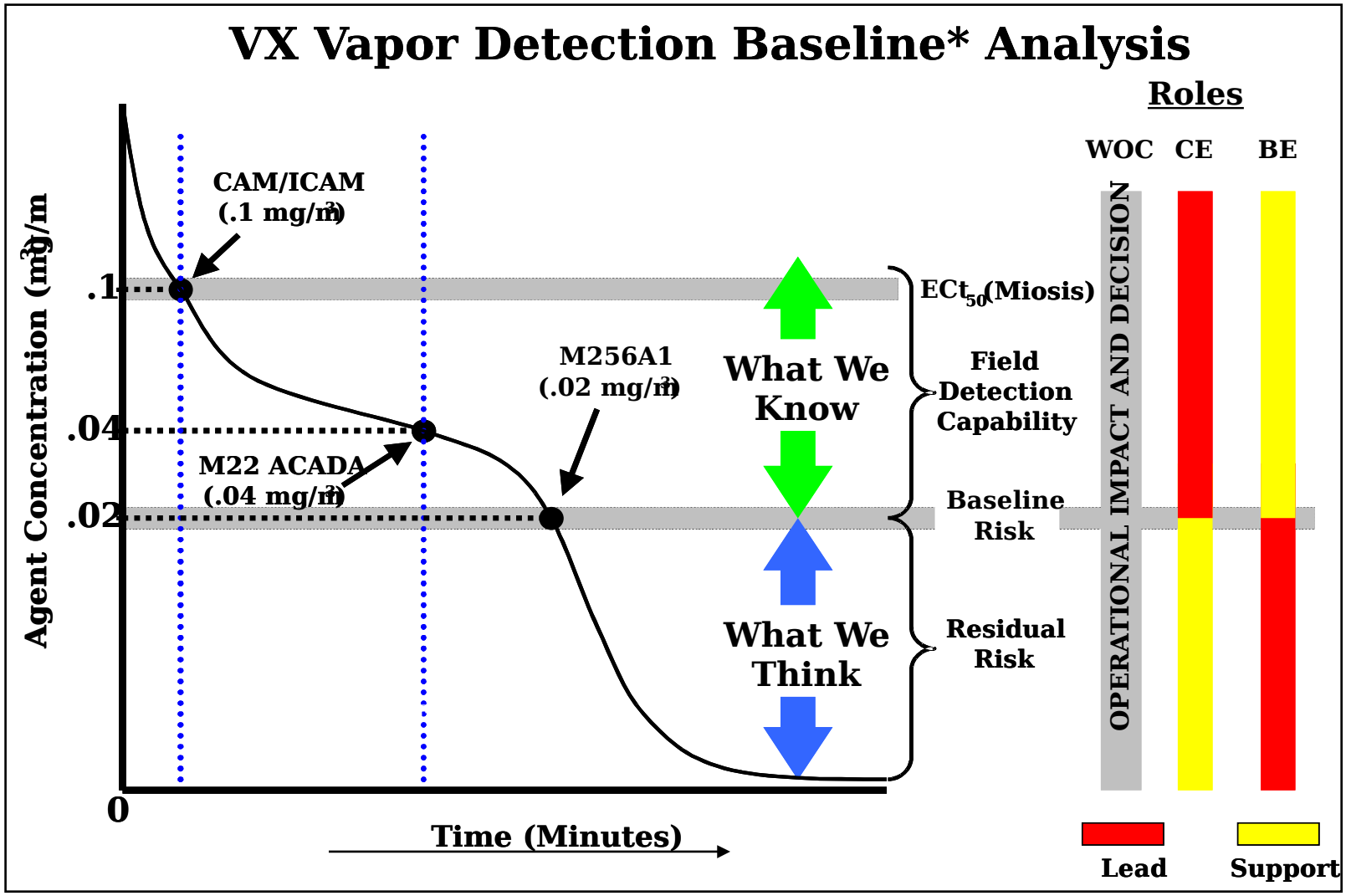
U.S. AIR FORCE

BE Capabilities

- **Health Risk Management (aka Medical Operational Risk Management)**
  - **Provide recommendations (wrt missions)**
    - **Improve operations**
    - **Sustain operations**
    - **Restore operations**
- **Communicate Health Risks**
- **Train**
  - **Health risks**
  - **Protective postures**

U.S. AIR FORCE

BE Capabilities



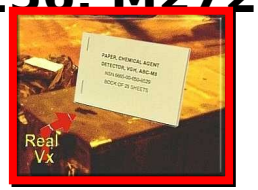
Response Equipment

U.S. AIR FORCE

Response Equipment

Previous Capability

HHA
ADM 300
Ion Chamber
Staplex
HVAS
LEL/O_2/ CO/H_2S
PID/FID
Env Sample Collection
Detector Tubes
M256, M272, M8/9

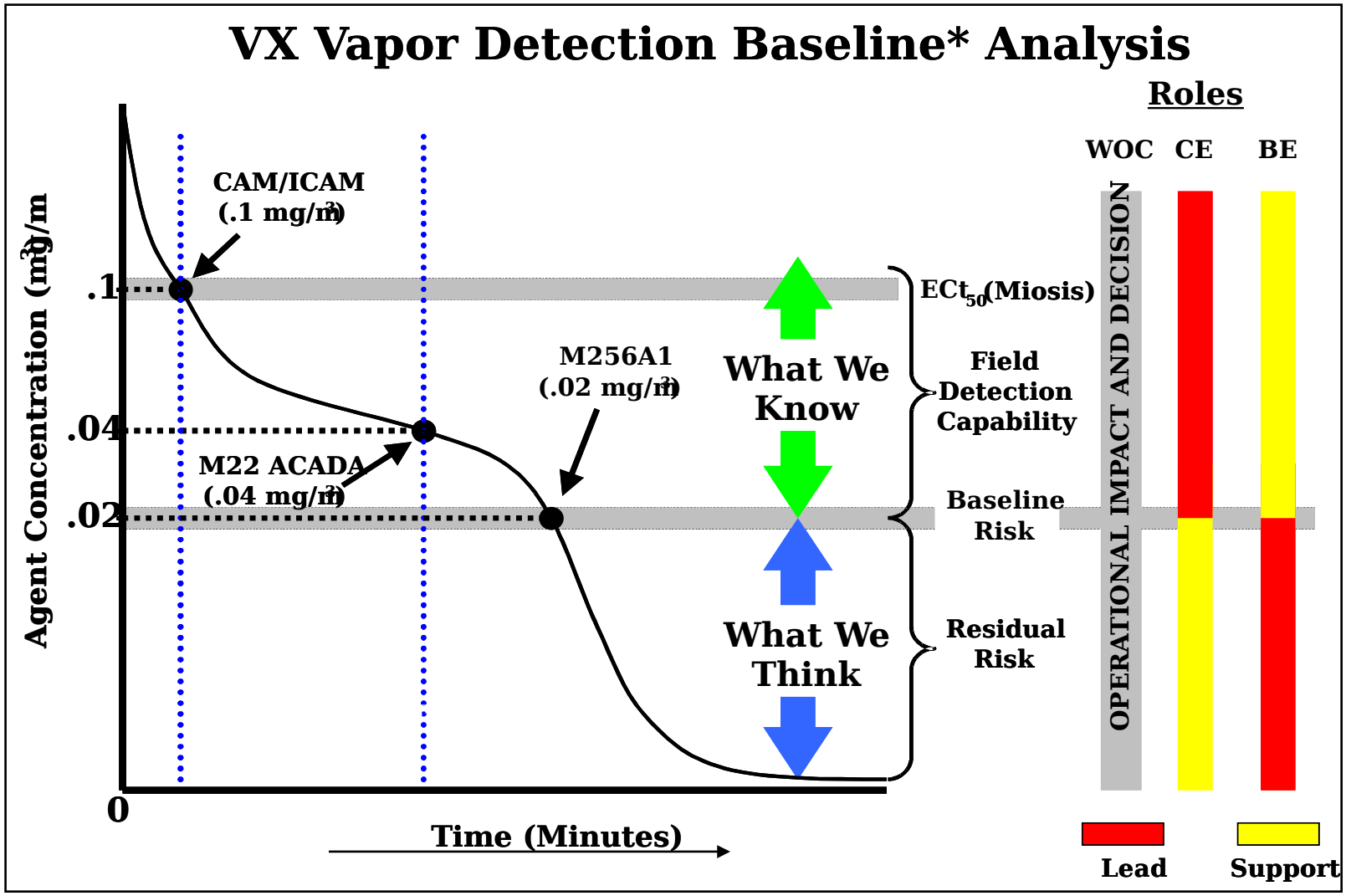


More Capability

HAZMAT ID
Gamma Spectrometer
XMX Bio-aerosol
HAZCAT Kit
Detector Tube Sets
RADECO HVAS

U.S. AIR FORCE

BE Capabilities



U.S. AIR FORCE

Response Equipment HAPSITE GC/MS

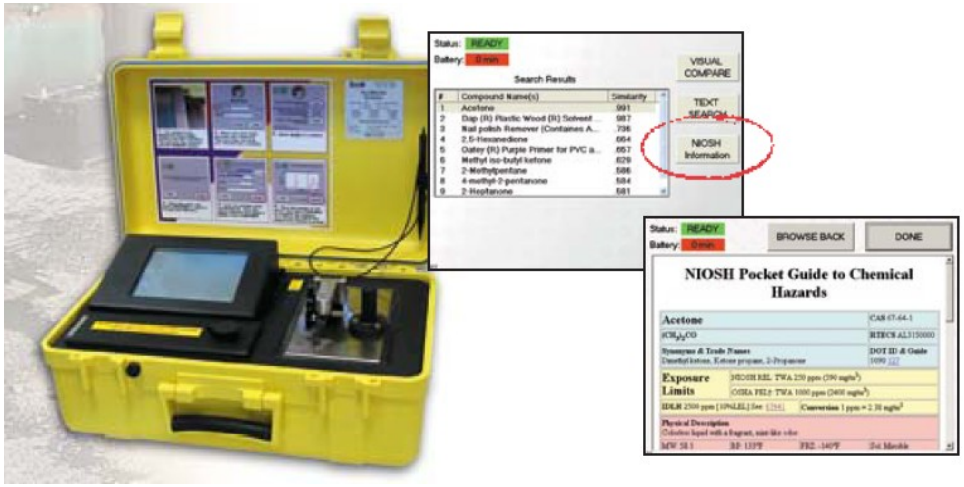
- **Capabilities**
  - **Identification of volatile (easily evaporated) organic vapors**
  - **Quantification (actual measured number for HRA)**
  - **Detects at concentration levels never before achieved**
- **Limitations**
  - **Result times vary**
  - **Doesn't measure all organics (molecular weig**
  - **Maintenance**
  - **Advanced skills required**

U.S. AIR FORCE

Response Equipment HAZMAT ID System

- **Capabilities**
  - **Identification of solid or liquid chemical compounds**
  - **Provides real-time detection**
  - **Excellent results in “white powder” responses**

- **Limitations**
  - **Identifies <u>presence</u> of biological material**
  - **Qualitative only**
  - **Sensitivities**



U.S. AIR FORCE

Response Equipment
HAZMAT ID System

U.S. AIR FORCE

Response Equipment HAZMAT ID System

U.S. AIR FORCE

Response Equipment Gamma Spectroscopy System

- Capabilities
  - Identifies multiple radionuclides
    - Industrial source?
    - Weapon source?
    - Medical source?
  - Calculates isotope-specifi
    dose rate (treatment sup
- Limitations
  - Operating temp range

Response Equipment
Draeger Civil Defense Kit

- Capabilities
  - Quick! (“Yes/No” answe
  - Agent-specific
    - Cyanogen chloride
    - Sulphur Mustard
    - Phosgene
    - Chlorine
    - Nerve Agents
- Limitations
  - Qualitative only

U.S. AIR FORCE

Response Equipment
High Volume Air Sampler

- Capabilities
  - Draws air through filter to collect particulate matter
  - Useful in Broken Arrow and some radiological dispersion device (RDD) scenarios (improved capability)
- Limitations
  - External power source required
    - Small generator
  - Tripod required
    - Measure at breathing zo

U.S. AIR FORCE

Response Equipment Electronic Personal Dosimeters

- Gamma/Beta Radiation Dosimeter
  - Replaces IM-143 yellow pocket dosimeters!

- Capabilities
  - For individual use
    - Responders into hot zone
  - Calculates Dose
  - Measures dose rate
    - Displays on Dosimeter

- Limitations
  - Operating temp range

U.S. AIR FORCE

Response Equipment

- Key “take aways”
  - Equipment response varies
    - Physiological effect levels
  - Equipment response times
    - Immediate / 20 minutes / 1 hour+
  - Biological detection is “presumptive”
    - Presence/Absence (not identification yet)
    - Need laboratory confirmation for definitive result

Guidance

U.S. AIR FORCE

Guidance

- **AFI 10-2501, Full Spectrum Threat Response (FSTR) Planning and Operations**
  - **FSTR OPlan 10-2**
- **AFI 41-106, Medical Readiness Planning and Training**
  - **Medical Contingency Response Plan (MCRP)**

U.S. AIR FORCE

Recommendations

- Know BE capabilities
  - Information provided by the BE responders
  - Specifics at your installation (differences exist)
- Know functional roles and responsibilities
  - Synergy and differences (risk types)
  - Communication between response elements
- Emphasize joint training
  - CEF, CED, CEX w/ BE and MDG
- Increase exercise timelines
  - Continue into consequence management phase
    - Assess long term health and environmental effects and impacts on mission

Questions?

MICHAEL J. RUSDEN, Col, USAF, BSC

Bioenvironmental Engineering Consultant

Chief, Environmental and Occupational Health Division

AFMOA/SGPB

110 Luke Avenue, Rm 405

Bolling AFB, DC 20032-7050

DSN: 297-4314; Comm: (202) 767-4314; Fax: 5053

BACK UP SLIDES

U.S. AIR FORCE

Primary USAF Vapor Detection Capabilities (1 of 2)

DETECTOR	AGENT	THRESHOLD CRITERIA (mg/m^3)	INSTRUMENT RESPONSE CRITERIA
CHEMICAL AGENT MONITOR (CAM)	VX	0.1	WITHIN 1 MINUTE
	HD		
	GB		
	GD		
	GF		
	L		
M22	VX	0.01	63 seconds
	HD	0.01	11 seconds
	GB	0.03	62 seconds
	GD	0.04	12 seconds
	GF	NO DATA	NO DATA
	L	0.01	12 seconds

U.S. AIR FORCE

Primary USAF Vapor Detection Capabilities (2 of

DETECTOR	AGENT	THRESHOLD CRITERIA (mg/m^3)	INSTRUMENT RESPONSE CRITERIA
M256A1	VX	Not Evaluated	10 - 20 MINUTES
	HD	2 (+/- 1)	
	GB	0.03 (+/- 0.02)	
	GD	No Data	
	GF	No Data	
	L	9 (+/- 5)	
HAPSITE (next few slides)	VX	0.01 to 0.0001	Generally > 15 minutes (faster if not a complex sample)
	HD		
	GB		
	GD		

U.S. AIR FORCE

Exposure Example

Instrument	VX Threshold Criteria (mg/m^3) ("detection limit")	Time to Miosis (0.1 $mg\text{-}min/m^3$) if at limit	Time to ICT 50 (10 $mg\text{-}min/m^3$) if at limit
M256A1	2 (assumed = to HD)	0.05 min (3 sec)	5 minutes
CAM	0.1	1 minute	100 minutes
M-22	0.01	10 minutes	1000 min (16.7 hrs)
Hapsite	0.001	100 minutes	10,000 min (6.9 days)